REMARKS

Claim Status

Claims 1-12 are currently pending, with claim 1 being in independent form. Claims 1-12 have been amended. No new matter has been added by way of the foregoing amendment. Reconsideration of the application, as amended, is respectfully requested.

Overview of the Office Action

Claims 1-6, 11 and 12 stand rejected under 35 U.S.C. §102(b) as anticipated by U.S. Patent No. 6,242,764 ("*Ohba*"), while claims 7-10 stand rejected under 35 U.S.C. §103(a) as unpatentable over *Ohba* in view of U.S. Patent No. 5,771,110 ("*Hirano*").

Applicants have carefully considered the Examiner's rejections, and the comments provided in support thereof, and respectfully disagree with the Examiner's analysis. For the following reasons, Applicants respectfully assert that all claims of the present application are patentable over the cited references.

Descriptive Summary of the Prior Art

Ohba discloses "a GaN-based compound semiconductor light-emitting element, comprising an AlN buffer layer, a GaN lattice strain moderating layer, and an n-type AlGaN contact layer formed on the layer" (see Abstract). *Ohba* (col. 9, lines 24-28) states that "an electrically conductive material is used for forming the substrate and an electrode is mounted to a back surface of the conductive substrate, with the result that the p-side electrode can be brought into contact with a heat dissipator".

Hirano discloses "a method of fabricating a thin film transistor by setting the temperature of a heat treatment for crystallizing an active layer which is formed on a substrate at a level not deforming the substrate and activating an impurity layer in a heat treatment method different from that employed for the heat treatment, and a semiconductor device prepared by forming a heat absorption film, a semiconductor film, a gate insulating film, and a gate electrode on a substrate, the heat absorption film being provided within a region substantially corresponding to the semiconductor film" (see Abstract).

Summary of the Subject Matter Disclosed in the Specification

The following descriptive details are based on the specification. They are provided only for the convenience of the Examiner as part of the discussion presented herein, and are not intended to argue limitations which are unclaimed.

The specification discloses (see paragraph [0008] of published application no. 2004/015231) a method for depositing a material on a substrate wafer having the following method steps of:

(a) providing the substrate wafer, which has a growth area intended for a later material deposition;

(b) applying a thermal radiation absorption layer, which exhibits a good absorption of thermal radiation on a rear side of the substrate wafer, which faces away from the growth area;

(c) heating the substrate wafer to a deposition temperature; and

(d) depositing a material onto the growth area of the substrate wafer by an MOVPE method;

wherein the thermal radiation absorption layer is applied before the deposition of a material onto the growth area of the substrate wafer.

Patentability of Independent Claim 1 under 35 U.S.C. §102(b)

Independent claim 1 has been amended to recite "wherein the thermal radiation absorption layer is applied before deposition of the material onto the growth area of the substrate wafer". No new matter has been added.

Amended independent claim 1 is directed to a method that is especially suitable for growing a semiconductor material on a substrate wafer using a MOVPE technique. The thermal radiation absorption layer is applied to the rear side of the substrate that faces away from the growth area. By means of this absorption layer, the substrate wafer is heated to the deposition temperature during growth of the semiconductor material. The absorption layer permits a homogenous temperature distribution on the substrate wafer during growth of the semiconductor material.

Ohba, on the other hand, discloses a gallium-nitride based light-emitting device. *Ohba* (col. 9, lines 24-28) states that "an electrically conductive material is used for forming the substrate and an electrode is mounted to a back surface of the conductive substrate, with the result that the p-side electrode can be brought into contact with a heat dissipator". Specifically, *Ohba* (col. 9, lines 28-32; Fig. 6) teaches that each of a SiC substrate 501 and a SiC buffer layer 503 is doped with an n-type impurity and, thus, exhibits an n-type conductivity. Also, an n-side electrode 522 is formed on the back surface of the n-type SiC substrate 501. Thus, *Ohba* teaches a device that has an n-side metal contact layer, and that this contact layer is applied to the rear side of the substrate.

The Examiner (pg. 2 thru pg. 3 of the Office Action) contends that:

> Ohba ... shows a variety of ways of depositing an AlGaInN layer on top (sic) of a SiC substrate while having a thermal absorption layer underneath the SiC substrate for exhibiting a good absorption of thermal radiation (See Col 2 Lines 15-68, Col 9 Lines 15-43 (5th Embodiment) and Figure 6).
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> ...
>
> [Figure 6] ... clearly shows a SiC substrate (501) with a Al/Ti n-side electrode (522) reason being that an electrically conductive material is used for forming the substrate and an electrode is mounted to a back surface of the conductive substrate, with the result that the p-side electrode can be brought into contact with a heat dissipator, suggesting that the underlying layer 522 is acting as a thermal absorption layer means.

With respect to the foregoing statement, Applicants respectfully assert that *Ohba* fails to teach the claimed invention recited in amended independent claim 1. It appears that the Examiner has equated the contact layer (i.e., n-side electrode 522) with the thermal radiation absorption layer of present claim 1, and has therefore concluded that the contact layer on the underside of the SiC substrate exhibits the thermal radiation absorption of claim 1. However, such a conclusion is illogical. *Ohba* teaches that it is the p-side electrode that can be brought into contact with a heat dissipater (see col. 9, lines 26-28; Fig. 6). That is, the p-side electrode 521 at the upper end of the *Obha* device is brought into contact with the heat dissipater. As shown in Fig. 6, the n-side contact layer of the *Obha* device is arranged at the opposite end of the device. Consequently, how could bringing the upper p-side electrode into contact with a heat dissipater suggest that the lower n-side contact layer 522 acts as a thermal absorption layer? In fact, *Ohba* fails to provide the slightest hint that the contact layer 522 acts as a thermal absorption layer, let alone one that acts as a thermal absorption layer during growth of semiconductor material on a substrate. *Ohba* therefore fails to teach the step of "applying a

thermal radiation absorption layer, which exhibits a good absorption of thermal radiation on a rear side of the substrate wafer, which faces away from the growth area," as recited in amended independent claim 1. Consequently, *Ohba* fails to anticipate independent claim 1 for at least this reason.

In addition, electrode layers, such as layer 522 disclosed in *Ohba*, are applied to the rear side of a substrate after the device structure has been grown. *Ohba* fails to teach that the electrode is applied before the device structure is grown. *Ohba* thus fails to teach that a thermal radiation absorption layer is applied before deposition of the material onto the growth area of a substrate wafer, as recited in amended independent claim 1. Therefore, *Ohba* fails to anticipate independent claim 1 for at least this additional reason.

Moreover, *Ohba* (col. 9, lines 50-52) states that "in the first step, a SIC substrate or a sapphire substrate is put on a susceptor, which also acts as a heater, included in the MOCVD apparatus". *Ohba* thus clearly teaches that it is the substrate (SiC or sapphire) that is initially applied to a susceptor. However, *Ohba* fails to teach the application of a thermal radiation absorption layer to the substrate on the susceptor. Rather, *Ohba* (col. 9, lines 60-61) teaches that a single AlN crystal or a SiC layer (col. 10, line 20) is grown on the substrate. Therefore, *Ohba* fails to anticipate independent claim 1 for least this further reason.

As discussed at paragraph [0006] of publication no. 2004/0152312, a metal layer placed on the rear side of a substrate, such as the substrate of the structure disclosed in *Ohba*, would lead to contamination of the reactor gas in a MOCVD apparatus. Previously, such metal layers were not used in MOVPE (metal organic vapour phase epitaxy), because such an additional layer on the rear side of the substrate wafer could lead to the introduction of contaminants in the reactive gas space. Applicants have achieved exactly what could not previously be achieved,

i.e., the application of a thermal radiation absorption layer on the rear side of a substrate wafer, wherein the thermal radiation absorption layer is applied before the deposition of a material onto the growth area of a substrate wafer, as recited in amended independent claim 1. *Ohba* fails to teach these limitations. In view of the foregoing, Applicants respectfully assert *Ohba* fails to anticipate amended independent claim 1. Reconsideration and withdrawal of the rejection under 35 U.S.C. §102 are therefore in order.

Moreover, due to the fundamental above-discussed differences between the present claimed invention and *Ohba*, it is clear that independent claim 1 is patentable over this reference under 35 U.S.C. §103.

Patentability of Claim 1 under 35 U.S.C. §103(a)

The Examiner has combined *Ohba* with *Hirano* in an attempt to cure the shortcomings of *Ohba* with respect to dependent claims 7-10. The combination of *Ohba* and *Hirano* fails to achieve the invention recited in amended independent claim 1, since *Hirano* fails to teach at least the step of "applying a thermal radiation absorption layer, which exhibits a good absorption of thermal radiation on a rear side of the substrate wafer, which faces away from the growth area ... wherein the thermal radiation absorption layer is applied before deposition of the material onto the growth area of the substrate wafer," as recited in amended independent claim 1. Consequently, Applicants respectfully assert that claim 1 is patentable over the cited references, applied individually or in combination.

Dependent claims

In view of the patentability of independent claim 1, for the reasons presented above, each of dependent claims 2-12 is patentable therewith over the prior art. Moreover, each of these claims includes features which serve to even more clearly distinguish the invention over the applied references.

Conclusion

Based on all of the above, it is respectfully submitted that the present application is now in proper condition for allowance. Prompt and favorable action to this effect and early passing of this application to issue are respectfully solicited.

Should the Examiner have any comments, questions, suggestions or objections, the Examiner is respectfully requested to telephone the undersigned in order to facilitate reaching a resolution of any outstanding issues.

It is believed that no fees or charges are required at this time in connection with the present application. However, if any fees or charges are required at this time, they may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,

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